DIGITAL OPULENCE

There is a growing sentiment that lavishing the HVACR landscape with IT attention will open the industry to a whole new world of possibilities, leading to greater efficiency and enhanced reliability

Story by Hannah Jo Uy | Assistant Editor

Dr Hüseyin Onbaşioğlu

Albert Baker

Frank Taaning Grundholm

Toros Arslanyan

Morten Schmelzer

Mathias Layher

"Everybody has got some idea about digitalisation, but no one knows what to do and where to start," says Dr Hüseyin Onbaşioğlu, R&D Manager, Mechanical Engineer, Friterm. Albert Baker, Co-Founder, Danalto, an IoT solutions provider, agrees, saying, "In many cases, end-clients are aware that digitalisation, specifically IoT and AI, can change their business and that they need to adopt these technologies to keep up, but they might not be well aware of how to adopt and how to get value from these types of technologies."

Undoubtedly, the age of digitalisation has created a paradigm shift across all businesses, including the construction industry and the HVACR manufacturing sector. In view of the rapid evolution of available technologies, there is a growing sentiment that stakeholders need to be educated on the true value integrating such features can bring.

Baker says that a common mistake made when engaging with new end-clients is that technical proof of concepts is required, when what is really required is proof of value exercises. "This means that the end-client and the solution provider should define where value would be realised and where problems would be solved," he

says. In relation to the HVACR sector, Dr Onbaşioğlu points out that digitalisation has many aspects. "The first is product digitalisation or digitalisation of equipment, which is employing digital features and capabilities to your product," he says. "The second is related to the manufacturing process, where digitalisation is used in the manufacturing process of the product. The last point is the digitalisation of your business model and processes with the consumers, where you communicate with consumers and use digital platforms to reach new customers. They are all under the digital evolution umbrella – digitalisation of product, manufacturing and of your way of businesses."

DIGITAL INTEGRATION TO ENHANCE INTERNAL PROCESSES

ABB Motion is one such example of a company that has been proactive in leveraging digital platforms to enhance internal processes. So says Frank Taaning Grundholm, Vice President, Global HVACR Sales, ABB Motion who adds that the company has recently finalised the implementation of 5G networks in one of its main factories and the use of robots in the manufacturing process. "We also integrated 5G devices into our systems, and the whole process is linked to our cloud system," he says. The 5G, he explains, is implemented to oversee quality monitoring and to facilitate live interactions between the operator and the cloud system in the factory.

Speaking for Friterm, Dr Onbaşioğlu discusses the use of digitalisation in the context of the company's proprietary software, which was developed to streamline the proper designing of products. "For example, a customer may ask for a very specially designed heat exchanger," he says. "You may not have the ability to calculate it, but you can write the methodology, calculation and implement it in the software." He adds that the company has been asked for custom-tailored equipment in many cases and that the use of software provides Friterm with the competitive advantage of being able to deliver products faster. "Through the software, you can switch to another product very easily,

you can design it, manufacture it and sell it very fast." Such flexibility, he says, would not be achieved if the software was outsourced, as the manufacturer would then have to communicate with the software developer on the methodology and calculation required, and the back and forth will lead to longer lead times and loss in immediate profits.

Artificial Intelligence (AI), Dr Onbaşioğlu says, can then be implemented to enhance the design process. "AI can help you reach the best, most optimised and efficient design," he says. "You have many parameters you enter into the software, you change it and get different results, but AI would help you to reach the best one." Dr Onbaşioğlu points out that while software development is an important pillar within the company's R&D, under the thermal and constructive design divisions, the laboratory also plays a key role in the process. "We need to confirm the software outputs with test results," he says. "If we design a heat exchanger on the software, we have to see the capacity, pressure drop performance and other factors, to be sure the software is working properly. So, you manufacture the heat exchanger, put it in the lab, you get results and compare it with the software. If you have a deviation of more than, for example, three per cent, you adjust the calculation to have a better output."

DIGITALISATION IN DESIGN SELECTION, INSTALLATION AND COMMISSIONING

In addition to enhancing product design, manufacturers are using digital platforms to aid customers in product selection during the project specification stage. Cenk is one such company, with Toros Arslanyan, Mechanical Engineer, Closed Circuit Cooling Systems Manager, sharing that the company's entire product range of cooling towers is available through a digital software, allowing customers to select models with given design temperatures, which is an advantage in cases where customers do not want to share specific requirements from the onset.

Morten Schmelzer, Technical Marketing Director, Systemair, also discusses how the Sweden-headquartered company aims to present the configuration options of its products throughout its channels in a straightforward manner to help streamline equipment selection and design.

"At Systemair, we are focusing on using, for instance, augmented and virtual reality for our technical education efforts as well as technical documentation," he says. "Today, across the industry, most clients receive dozens of pages of manuals from manufacturers, and technicians have to figure out how to navigate them. We aim to support them through virtual and augmented reality. Users will receive interactive visual guidance in real time." Schmelzer says this especially benefits an area that takes the most hits owing to project deadlines – installation and commissioning. The company's apps and digital support network, he points out, would make life easier for those that have to commission and launch entire solutions that may be composed of different products that have different technical guidelines. "Through this process, you can visually guide them and also project live data values," he says.

DIGITALISATION FOR PLANNED MAINTENANCE AND OPERATIONS

For Grundholm, the sector that will receive the immediate benefit of digitalisation is Facilities Management. Currently, Grundholm says, building owners and FM providers are still heavily reliant on building maintenance schedules. "They send a person out on morning A, only for the person to find that he didn't have the part he needed in the car, and he has to go back to the head office," he says. "The fact that you can get a warning that maybe the bearing is failing allows you to have a spare motor or bearing, and if there is something wrong you can change it. You don't have to spend two or three hours to figure it out." Through digitalisation, FM providers can rely less on a schedule and, instead, identify when there is a warning situation that requires attention before it becomes a critical problem, Grundholm says, pointing out that this will lead to significant operational savings.

Speaking in the context of the cloud system ABB has introduced, Grundholm says the company is working in a collaborative manner with operation centres looking at District Cooling networks, temperature management and at whether pumps are performing as intended or not. "We, for example, monitor the health of individual components, condition of bearings, and the condition of the harddisk on the SCADA system," he says. "Customers wouldn't think about monitoring how much

of the harddisk storage capacity is actually used. We have experience that at 93 or 94 % capacity usage, you start getting system issues, so we send a warning to customers to have a look at either cleaning data or adding storage capacity."

Bitzer is also proactive in its digital integration, with Mathias Layher, Director, Sales AC, Marine and Process, discussing the company's IQ products, which have an interface and collect data. "The inverter will collect the data, which can be transferred to the controller of the Building Management System," he says. "And it can even go far, because in some products we have Bluetooth. So, the software with Bluetooth allows you to see where the compressor is running and look at failure modes, which makes it easy to maintain." Layher says that while the software has been available for some years in desktop version, the Bluetooth connection and mobile device conversion was introduced much recently. "With the smartphone, you can walk up to the compressor, collect data, see if something is wrong and send data to someone else," he says. "If there is an issue you can send the data to us, and we can look at the same data. The app is free and is well accepted in the field. In general, all our IQ products have this capability. We have also introduced an IQ module, which means you can make your standard [Bitzer] compressor intelligent."

THE MANY BENEFITS OF DIGITALISATION

Schmelzer adds that such digital features are especially beneficial for owners of multiple facilities. "If you are a hotel owner with, let's say, 200 facilities, you have units all over the place," he says. "For the ones responsible for the maintenance of all the HVAC systems, it is very helpful to see how units are performing, not only live in the cloud but also whether there are malfunctions and when units need to be cleaned, so the systems warn him automatically."

For Layher, integrating digital features is especially important in view of the lack of skilled workforce in the market. "It's hard to get trained people," he says. "[These solutions] help give the technicians an opportunity to look at the compressor before they go on site. So, I think, in the future, this will be even more important to help better equip the workforce to take care of what is needed, reduce man hours and make better decisions." Grundholm also highlights the importance of workforce optimisation, telling FM companies, "If you manage your fleet of service cars effectively, you can do more without having to add people. A car stuck in traffic isn't doing any work, nor is the one driving the car. You need them to be in buildings. Also, customers may not be able to explain the problem well enough over the phone. When the service technician drives or flies to the site, he may only

have to change parameters that would take only 15 minutes – that's a lot of wasted resources. When you are more efficient with the workforce, it's less wasted time and the requirement for additional labour reduces, as existing workforce will be made available where they are most needed."

In addition to reduced labour, integrating digitalisation in operations and management can greatly improve building performance, especially in view of wider sustainability goals. Baker says: "Energy has been the biggest and most compelling story when it comes to IoT and AI. The reason for this is because with energy data, a lot of insights can be inferred. Sustainability targets can be assessed and costs can be analysed and checked against the one data point they do have – their bill. Operations can be probed, and stakeholders can check when certain machines start and stop and what this means." Baker points out that digitisation, in the form of light touch energy monitoring, such as LPWA networks and non-invasive clamps, can allow businesses to take a step back and assess their consumption, be it electricity, gas or water. "In the UAE and Middle East, in particular, where AC is heavily used, condition and consumption of these systems is key to ensuring that buildings are operating in a sustainable fashion," he says.

Grundholm also highlights how good maintenance through digital platforms can enhance indoor environmental quality. "Filters of air-handling units are often changed based on schedule of running hours," he says. "But actually change should be based on the level of pollution in the air. Having sensors can evaluate how dirty the filters are and then do it intelligently."

Providing a cold chain perspective, Baker points out that IoT can greatly enhance food safety monitoring and quality monitoring in a number of ways. "IoT generates more data and at a granular level that wasn't economically or practically possible before enabling technologies like LPWA networks came about," he says. "This means that rather than monitoring a refrigerated unit for temperature dips and increases, temperature can now be monitored in the cold chain systems as a whole. This allows a record to be built where, from a compliance point of view and customer satisfaction aspect, data verifies quality and longevity of a product."

Baker points out that essentially food should be temperature-controlled.

Detecting at what point in the chain it has not been adhered to, he adds, is critical to maintaining consistency in terms of safety and quality. City governments, he further adds, can greatly benefit from integrating such technologies by stipulating that data be used to verify metrics like temperature in live form. "Up to now, spot checks are used to check quality safety of products, but this only tells part of a story when it comes to the lifecycle of a product from farm to fork," he says. "Live data through IoT, cloud and AI services enable a fuller picture and present real insights, if and when issues occur."

BOTTLENECKS TO ADOPTION

While the benefits of integrating digitalisation is evident, the level of adoption still varies. Schmelzer says that while cost may be perceived as a barrier for adoption of digital solutions, a more pressing bottleneck is lack of awareness on the benefits investing in such solutions bring to the project in the medium- to long-term. "It really depends on the market – how mature the market is, how knowledgeable the market is, how common these types of technologies are, and how much they are used by consultants and installers," he says. "Cost is only one factor, but the focus needs to shift on lifecycle costs and not just initial product price." Weighing in, Baker says that more than cost, the complexity of deployments and lack of clarity around the value of the data being generated are the two most common reasons why some digital solutions do not seem to get off the ground.

Grundholm says it is important for stakeholders to have a better understanding of the cost of not investing in such technologies. Providing an example, he shares that during a pilot test, ABB's cloud system was added to an AHU. After installation, the team running the pilot received a yellow warning, indicating an issue with the system. However, the maintenance team was not informed, as it was a pilot. "One month later, it turned red," he says. "Because it had gone all the way to the red alarm, there was much more service requirement to get the unit up and running. The cost of managing the issue quadrupled, because it wasn't handled as early as it could have been. So, when you look at the cost, it may seem a little high, but think, what is the cost of fixing an issue?" Grundholm adds that the loss of profit owing to breakdowns is not as appreciated among building owners, as it is in some industries. "For example, in soda-producing companies, if I have a breakdown for 20 minutes, I am not able to produce X number of bottles," he says. "We don't think that way in HVAC, it's not a production environment, but there is a cost to maintaining the equipment, and that cost increases if you have to get service in the middle of the night."

Grundholm says that avoiding breakdown through proper maintenance is not only important for mitigating cost but also for ensuring reliability of systems, which is especially vital in mission-critical facilities, such as District Cooling ⊕

plants. "For these facilities, it is important to have good condition monitoring to ensure cooling is supplied to buildings," he says. "If a cooling network breaks down, things can quickly escalate. If a central supply plant has an issue, buildings connected to it, which could be data centres or even hospitals, will get affected, and this could result in a catastrophic breakdown."

Grundholm emphasises that digitalisation is not only available to big plants and facilities. "The platform is maturing," he says. "Two years back, most of the solutions in the market could be very cost prohibitive for small- and medium-sized enterprises in the HVAC industry. Today, we are approaching a time where it makes sense for these enterprises to adopt such solutions." Grundholm says ABB is developing solutions in this direction. "For our drives, we have an app that will be updated soon. This will allow stakeholders to have direct communication with experts in the call centre via the app, which supports remote monitoring," he says. "These solutions coming into the market are mainly targeted at SMEs."

Baker also advocates such holistic thinking among stakeholders in the food industry, pointing out that cost is not typically a bottleneck when it comes to integrating IoT for food quality monitoring, as business cases can be generated to ensure the system is economical. "However, when an incident in terms of food can damage a brand and potentially ruin a company, it is prudent now for enterprises to invest in the latest technologies in order to remove any blind spots they have in terms of data," he says. "These are possible now and will become part of our everyday lives in the future."

ASKING THE RIGHT QUESTIONS

However, Grundholm warns that when it comes to integrating digital solutions, companies must be discerning as to the quality of the solutions being offered. "There is a massive amount of companies offering digital solutions," he says. "The questions you have to ask are: 'Is this sustainable?' 'If the company, being a small one, suddenly disappears, can it maintain the system?' 'Would the system run if the company were not there?" While this is an issue when it comes to smaller companies, when dealing with more mature solution providers, Grundholm says that historically, BMS suppliers had a particular proprietary network. "Everyone had their own protocol and couldn't talk to each other," he says. "If you started in one system, you had to stay
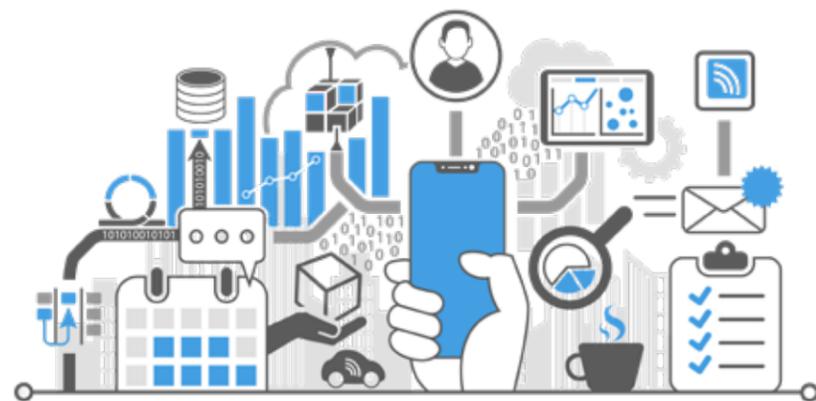
in that system throughout. So, we need to be careful that when we select digital solutions that they are expandable, that you can extend the system and add to it, like new sensor technologies. You have to ask yourself: What can I do with my system in 3-5 years? How much flexibility do I have when selecting solutions? Some of these digital solutions move so fast. What is new today is obsolete in three years' time. In three years, you may want something more, something different, and you want to make sure the platform can be adopted."
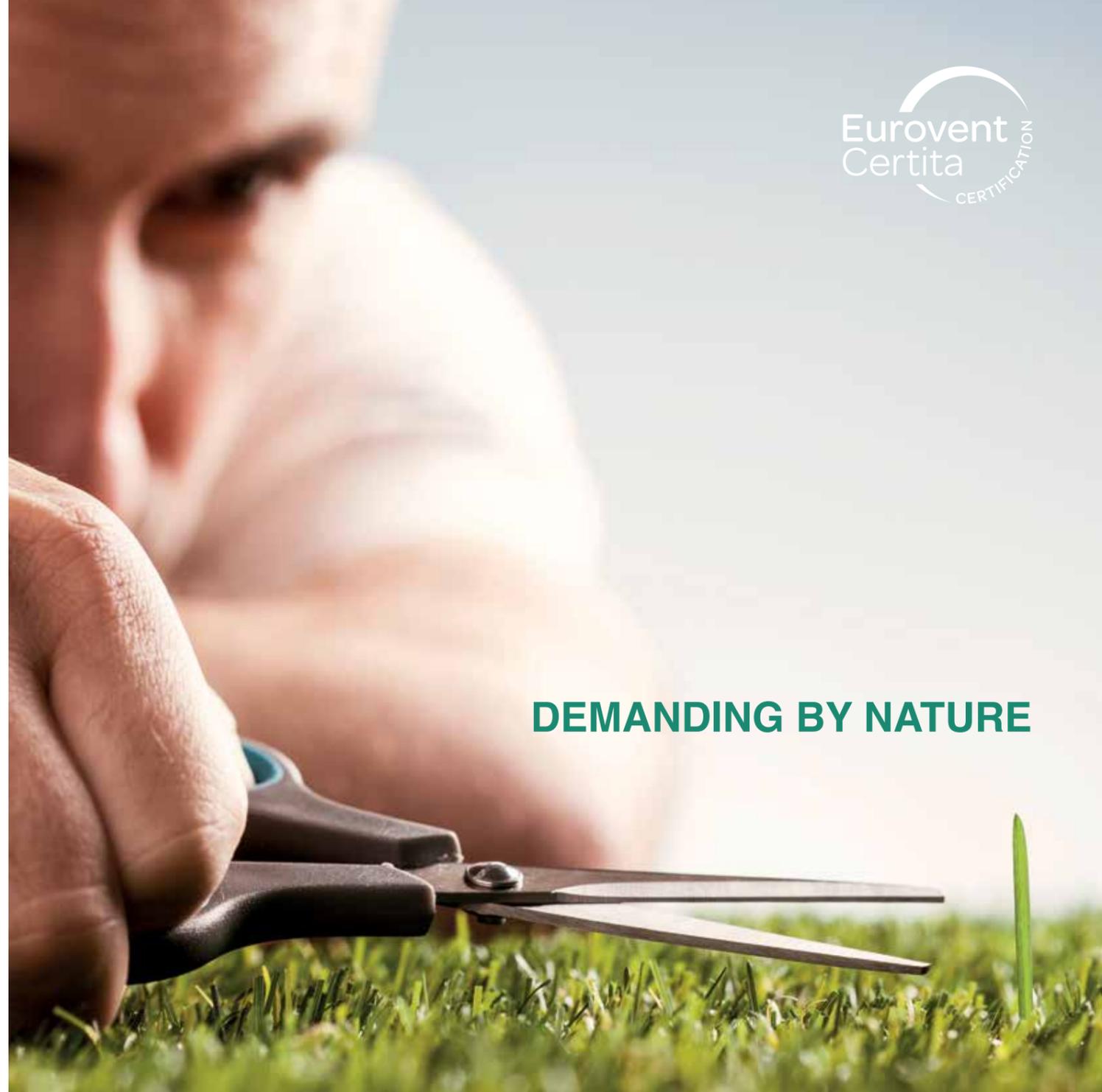
Providing the perspective of a technology-solutions provider, Baker points out that the key aspect of any deployment is secure data, sent reliably in a format that realises the value and proves the worth in the solution, for IoT and AI to inform better decision-making. "The questions to ask specifically should come from working back from the value proposition," he says. "As an example, people could begin by saying: 'I need to take action when I know the air quality in a building where people are working hits a certain level. Therefore, will I receive timely data to inform me of this change? How do I set a threshold on this live data, so I'm alerted only if the threshold is breached?' Typically, operation managers do not have time to go through large data sets. Finally, stakeholders have to ask, Who is managing this data service for me? The last thing an Operations Manager wants above their own tasks is to now have to maintain an IoT deployment." In such cases, Baker says that AI then comes into play, where rather than react to an event, like poor air quality, the system will predict based on occupancy, weather and the condition of AC units, among other factors, when air quality will be poor and any exposure to poor air quality will be avoided. "In the long term, support is required in managing this service," he says. "Just as air and water

flow in any building, data should equally flow and do its job. It will not typically be businesses' responsibility to manage this data. They, as the end-user, simply want to benefit from the data. Therefore, a solution provider should ensure their business model reflects this, and recurring support and maintenance contracts are required to support these engagements."

For Schmelzer, stronger regulatory requirements in terms of minimum energy performance levels and building inspections would help further encourage the adoption of digital solutions in the HVACR sector. "The ultimate driver, initially, tends to come from the regulatory side," he says. "Why do such technologies have better adoption in some areas compared to others? Because the government sets certain requirements, which push the manufacturer or building owner in a certain direction. It's the same with eco-design and energy performance requirements of buildings in Europe. The market needs to receive a push in the right direction, to have incentives and higher requirements for energy efficiency and indoor air quality. When this happens, it tends to be more likely that digital solutions are being adopted – and adopted well – because you would need them to support initiatives towards achieving efficiency targets."

At the end of the day, Schmelzer says, the solutions must offer a real added value beyond the design. "Digital solutions are not an all-purpose weapon," he says. "People can say a lot about digital technologies, but to follow it is another question. It's not just about what you see, it's what is behind all of it. It has to have an impact in the building, help the consumer and, at the end of the day, make the client's life easier and better." **ccme**

HAVE YOUR SAY!
We welcome your views on the article.
Write to **editor@cpi-industry.com**

DEMANDING BY NATURE